Patent claims

1. A method for producing a complete three-dimensional molded body layer by layer from at least two partial quantities (7, 10, 52) in the form of layers of at least a first starting material,
which produce the complete molded body,
the starting material (7, 10, 52) being melted and directionally solidified,
a starting plate (4) with a specific crystalline structure
which predetermines the crystalline structure for the three-dimensional molded body being used,
so that the compaction takes place by a directional solidification by means of epitaxial growth,
whereby the partial quantities (7, 10, 52) of the at least one starting material are bonded together.

2. The method as claimed in claim 1,
characterized in that

a compaction treatment is carried out with at least one of the partial quantities (7, 10, 52).

3. The method as claimed in claim 2,
characterized in that

a thermal compaction treatment is carried out.

4. The method as claimed in claim 1,
characterized in that

a laser is used to bond the partial quantities (7, 10, 52) together.

5. The method as claimed in claim 2 or 3, characterized in that

a laser (16) is used for the compaction treatment.

6. The method as claimed in claim 1, characterized in that

a powder compact or a metal sheet or a metal foil is used as the partial quantity (7, 10).

7. The method as claimed in claim 1, characterized in that

a three-dimensional molded body with grain boundaries is formed by the directional solidification, the grain boundaries running only in one direction (25).

8. The method as claimed in claim 1, characterized in that

a monocrystalline three-dimensional molded body is formed by the directional solidification.

9. The method as claimed in claim 1, characterized in that

the three-dimensional molded body is produced in such a way that it has a material gradient.

10. The method as claimed in claim 9, characterized in that

at least one of the partial quantities (7, 10, 52) has a material gradient.

11. The method as claimed in claim 9, characterized

in that at least one material supply (46, 49) is used to supply material for the molded body, and in that the material gradient is produced by controlling the material supplies (46, 49) in terms of time and/or location.

12. The method as claimed in claim 9 or 11, characterized

in that at least one material supply (46, 49) for the supply of partial quantities (7, 10, 52) of at least one starting material is used, and
in that starting material is supplied by the at least one material supply (46, 49) during a specific time period,
the material composition of the starting material which is supplied by the at least one material supply (46, 49) changing during this time period,
so that a material gradient is created in the partial quantities (7, 10, 52).

13. The method as claimed in claim 9 or 11, characterized in that

partial quantities (7, 10, 52) for the starting material are supplied by at least two material supplies (46, 49),
the first material supply (46) supplying a first material composition and
the second material supply (49) supplying a second material composition,
and the two material supplies (46, 49) supplying respective material at different locations,
so that a material gradient is created in the partial quantities (7, 10, 52).

14. The method as claimed in claim 4 or 5, characterized in that

the geometry of the three-dimensional moulded body to be produced is fixed by a movement of the laser beams (13) of the laser (16) over the partial quantities (7, 10, 52).

15. The method as claimed in claim 1, characterized in that

an additional heater (34) is used to heat up the starting plate (4) and/or the starting material (7, 10, 52) or to keep it at a certain temperature.

16. The method as claimed in claim 1, characterized in that

the moulded body is formed only from partial quantities (7, 10, 52) in the form of layers.

17. The method as claimed in claim 1, characterized in that

the partial quantities (7, 10) in the form of layers have a thickness of from 0.1 mm to 1 cm.

18. The method as claimed in claim 1, characterized in that

the molded body is longer perpendicularly to a plane in which the partial quantities (7, 10) in the form of layers extend than the extent of the molded body in this plane.